SECTION 6.0
ENVIRONMENTAL IMPACTS OF UNLOADING NAVAL SPENT NUCLEAR FUEL AT A REPOSITORY SURFACE FACILITY OR A CENTRALIZED INTERIM STORAGE FACILITY

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6.0 ENVIRONMENTAL IMPACTS OF UNLOADING NAVAL SPENT NUCLEAR FUEL AT A REPOSITORY SURFACE FACILITY OR A CENTRALIZED INTERIM STORAGE FACILITY

6.1 Overview

This chapter addresses issues related to the unloading and handling of naval spent nuclear fuel at a notional or representative geologic repository surface facility in preparation for disposal or at a centralized interim storage facility for storage prior to being moved to a repository for disposal. For the multi-purpose canister alternatives, the naval spent nuclear fuel will arrive at a repository surface facility or centralized interim storage site in the same container that will be used for interim storage or for disposal. The multi-purpose canisters would only need to be removed from the shipping overpack and inserted into either storage or disposal overpacks. However, once at a repository surface facility, the other container system alternatives require that the individual naval spent nuclear fuel assemblies must be removed from the containers which were used for shipping and the naval spent nuclear fuel must be placed into a disposal container. Therefore, the impact on the environment surrounding a repository surface facility is different for the alternatives which make use of multi-purpose canisters than for the other container alternatives. A detailed discussion of all resources and environmental attributes is not presented here due to the uncertainty in the location of these facilities. Rather, this chapter presents a discussion of the impacts on the environment which are related to different operations at either of these facilities due to the container system alternatives. Thus, this chapter is intended to identify any particular issues associated with the selection of a container system that arise from repository or interim storage operations.

Site-specific repository operations and accident analyses will be the subject of the site-specific EIS for the particular facility. The Navy will participate and contribute to that EIS, as appropriate. This participation will include, at a minimum, the contribution of naval spent nuclear fuel to the cumulative impact for all of the spent nuclear fuel operations at the repository.

6.2 Assumptions

It is assumed that naval spent nuclear fuel will be disposed of at the same geologic repository that is used for civilian spent nuclear fuel and that a repository surface facility will be designed to accept and handle naval spent nuclear fuel in the same conceptual fashion as civilian spent nuclear fuel. As previously discussed in Section 3.2, the alternatives which use M-140 transportation casks have the potential to significantly impact the final facility designs. For operations involving the unloading of naval spent nuclear fuel from M-140 transportation casks, it is assumed that the final design of the facilities would allow for the operations to take place inside of the building with high efficiency particulate air filtering capability. Some special adapters may be required to handle the M-140 casks. In anticipation that transfer container operations, similar to those in use at the Expended Core Facility, may be required, a hypothetical accident scenario involving a dropped transfer container was evaluated for the M-140 alternatives to cover these unique operations. Therefore, the operations anticipated for unloading naval spent nuclear fuel from M-140 transportation casks do not present any increased risks when compared to the operations required to unload the other container alternatives.

Since the location of a geologic repository and detailed design of a repository surface facility have not yet been finalized, the site and operational characteristics of a hypothetical repository site and spent nuclear fuel unloading facility had to be assumed for the purpose of comparing the

environmental impacts of the different container system alternatives. A site specific environmental setting cannot be presented here since the exact location of the repository would be needed.

For purposes of analysis in this EIS, it is assumed that a representative centralized interim storage site would be located at or near a representative repository surface facility and would be the same as that for civilian spent nuclear fuel. Therefore, the same assumptions concerning methodology, population, meteorology, and distance to the boundary of the facility apply to either unloading at a repository or unloading at a centralized interim storage site.

6.3 Impacts

6.3.1 Methodology

Impacts due to airborne releases of radioactive materials at a hypothetical repository or a hypothetical centralized interim storage site due to unloading of naval spent nuclear fuel were evaluated. Calculations were performed to estimate the impact on surface facility workers and the public due to estimated radiological air emissions resulting from the handling of naval spent nuclear fuel inside of the shielded, filtered cells of the spent nuclear fuel handling facility. The specific methodology and computer codes used for these analyses are presented in Appendix A, Section A.2.3.

6.3.2 Population

For calculational purposes, a population density of 45 persons per square mile was used for a hypothetical repository or centralized interim storage site. This density is equivalent to the average population density in the western United States. The distribution of the general population is assumed to be uniform in all directions except that no members of the general public are within the site boundary. The site boundary is assumed to be three miles from the location of the surface facility.

6.3.3 Meteorology

For meteorological conditions, Pasquill Class D with a wind speed of 13.2 ft/s (approximately 4 m/s) was used for normal operations and Pasquill Class F with a wind speed of 3.3 ft/s (approximately 1 m/s) was used for accident conditions. These are national average values and are further described in Appendix A.

6.3.4 Radiological Results

The airborne release of radioactive materials due to incident free operations associated with unloading naval spent nuclear fuel and special case low-level waste at a surface facility will be extremely small. Results are presented in Table 6.1. There will be no releases for the alternatives which make use of multi-purpose canisters since these containers will be seal welded during loading operations at INEL and would not be opened at a repository or centralized interim storage site. An assessment of the impact on the public of the small amount of radioactive material which could pass through the high efficiency particulate air filters of the surface facility for the other alternatives was performed. The maximum exposure that a member of the public is expected to receive in the busiest year of unloading at a surface facility would be 1.4×10^{-6} rem, resulting in an annual risk of developing latent fatal cancer of 7.2×10^{-10} or 1 chance in 1.3 billion. Radiological impacts of accidents are presented in Table 6.2. Again, the annual risk of public health effects due to these

hypothetical accidents is extremely small. Details of the analyses are presented in Appendix A, Section A.2.4.

TABLE 6.1 Estimated Annual Health Effects from Unloading Operations for Naval Spent Nuclear Fuel and SCW at a Hypothetical Surface Facility: Normal Operations, All Container Alternatives Except MPCs[a]

Facility Worker		MEI		General Population	
Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities
5.4×10^{-5}	2.2×10^{-8}	1.4×10^{-6}	7.2×10^{-10}	2.4×10^{-2}	1.2×10^{-5}

[a] Notation: MEI = individual at nearest site boundary; SCW = special case waste; MPC = multi-purpose canisters.

TABLE 6.2 Estimated Health Effects from Hypothetical Surface Facility Accidents for Naval Spent Nuclear Fuel and SCW Due to Storage and Unloading Operations[a]

	Facility Worker		MEI		General Population		
Accident	Dose (rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities	Collective Dose (person-rem)	Latent Cancer Fatalities	Annual Risk
Mechanical Damage (Wind-Driven Projectile)[b]	3.5×10^{-1}	1.4×10^{-4}	2.1×10^{-3}	1.0×10^{-6}	3.6	1.8×10^{-3}	1.8×10^{-8}
Dropped Transfer Container[c]	1.7×10^{-2}	7.0×10^{-6}	1.0×10^{-4}	5.2×10^{-8}	1.8×10^{-1}	9.0×10^{-5}	9.0×10^{-10}

[a] Notation: SCW = special case low-level waste; MEI = individual at nearest site boundary;
[b] Values listed for high-capacity M-140, transportable storage cask, and dual-purpose canister alternatives. Values for other alternatives are less.
[c] Applies only to M-140 and high-capacity M-140 container alternatives.

The environmental impacts on the areas of waste generation and land resources were assessed qualitatively. Radiologically contaminated casks and canisters would be decontaminated prior to recycling or disposed of in a low-level radioactive waste burial facility for all alternatives except the multi-purpose canisters. See Section 4.5.2 for more details. Thus, the container systems which have the least impact on the environment for both low-level waste disposed of and the amount of land required for disposal are the multi-purpose canister alternatives.

6.4 Topics Not Evaluated in Detail

Several other resources and environmental attributes were evaluated for INEL in Chapter 5. These attributes were not evaluated in detail for a hypothetical geologic repository or centralized interim storage site, since a specific site location is not known, the impact on the attributes are not expected to be large, and the evaluation would not help to discriminate among the container alternatives. These areas include ecology, air quality, cultural resources, socioeconomics, water resources, environmental justice, aesthetic and scenic resources, geology, noise, and electricity consumption.

6.5 Cumulative Impacts

Since the amount of naval spent nuclear fuel and special case low-level waste handled at the repository or centralized interim storage surface facility will be extremely small when compared to the amount of civilian spent nuclear fuel, cumulative impacts were evaluated qualitatively. As stated above, naval spent nuclear fuel would be placed in the same geologic repository or located at the same centralized interim storage site that would receive civilian spent nuclear fuel. In Appendix B, an estimated shipping schedule for naval spent nuclear fuel is presented. Depending upon the container alternative, about 15 to 25 containers of naval spent nuclear fuel per year would arrive at the surface facility, which is less than 4% of the total number of containers of spent nuclear fuel arriving at the facility each year. Over the 25 years of unloading operations evaluated in this EIS, about 300 to 500 naval spent nuclear fuel containers and about 45 to 85 special case low-level waste containers would arrive at the surface facility, which is less than 3% of the total number of civilian spent nuclear fuel containers to be received. It is expected that the environmental impacts due to unloading naval spent nuclear fuel and special case low-level waste at the surface facility would be in proportion to the total number of spent nuclear fuel containers received at the facility and, thus, these activities would have a small impact on the environment and the surrounding population at the site.